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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/524,215	02/10/2005	Yasuhiko Kojima	265769US26PCT	6423
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OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			EXAMINER CHEN, KEATH T	
			ART UNIT	PAPER NUMBER
			1792	
			NOTIFICATION DATE	DELIVERY MODE
			08/06/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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Office Action Summary	Application No. 10/524,215	Applicant(s) KOJIMA ET AL.	
	Examiner Keath T. Chen	Art Unit 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 July 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,2,4-10,12-17,19 and 20 is/are pending in the application.
- 4a) Of the above claim(s) 6-10 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,2,4,5,12-17,19 and 20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 07/22/2008 has been entered.

Response to Amendment

The claim amendment filed on 07/22/2008, addressing claims 1-5 and 12-18 rejection from the final office action (01/22/2008) by amending claim 1 and adding new claims 19-20. Claims 1, 2, 4-10, 12-17, and 19-20 remain pending and will be addressed below.

Election/Restrictions

2. Claims 6-10 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected Invention II, there being no allowable generic or linking claim.

Claim Rejections - 35 USC § 112

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

3. Claims 1-2, 4-5, 12-17, and 19-20 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

4. The term "near" in claim 1, line 13, is a relative term which renders the claim indefinite. The term "temperature sensor ... near the sealing member" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Claim 1 will be examined as temperature sensor in any degree of closeness to the sealing member.

Claim Rejections - 35 USC § 103

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

5. Claims 1, 2, 4, 12, 15, and 19-20 are rejected under USC 103 (a) as being unpatentable over Ryusuke et al. (JP 05-009740, hereafter '740), in view of Kobayashi et al. (US 5470451, hereafter, '451), Grosshart (US 5948283, hereafter '283), Anderson (US statutory invention registration H001145, hereafter '145), Kim (US 5983998, hereafter '998) and Kazama et al. (US 5567267, hereafter '267).

'740 teaches some limitations of:

Claim 1: A substrate processing apparatus comprising:

- a processing chamber (container 17 in Drawing 8 and [0004]) for accommodating a substrate (wafer 2 in Drawing 8 and [0004]) therein;
- a mounting table (ceramic base 3 in Drawing 8 and [0004]) for mounting the substrate thereon;
- a heating member (heating elements 4 and ceramic heater 1, as shown in Drawing 8 and [0004]) disposed in the mounting table, for heating the substrate;

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- a sealing member (O-ring 12 in Drawing 8 and [0005]) disposed between the mounting table and the processing chamber,
- A temperature sensor near the sealing member (thermocouple #21, drawing 8 and [0006]),
- a cooling unit (water-cooled jacket 16 in Drawing 8 and [0005]), having a cooling medium (water), for cooling the sealing member included therein.

Claim 4:

- a processing gas supply system (gas supply hole 18 in Drawing 8 and [0004]) for supplying a processing gas into the processing chamber.

Claim 19:

- a power supply ([0005], line 8), disposed outside the chamber (as shown in drawing 8), for supplying a power to the heating member (heating element 4) being connected to the power supply via lead wires (lead 9, [0005] line 7),
- the substrate is process by using a processing gas supplied into processing chamber (as shown in drawing 8), and the sealing member prevents the lead lines from contacting with the processing gas (with O-ring 12 the gas will leak outside the chamber and expose/contact the lead wire 9).

'740 teaches water cooled jacket, but is silent on the mode of water cooling mechanism. The examiner takes official notices that it is well know that the heat of vaporization of water (the latent heat) is much larger than the heat content of water temperature.

'740 does not specifically teach

- the sealing member is between the bottom of the support of the mounting table and a bottom portion of the processing chamber (for amended claim 1).
- (a cooling unit) by using a latent heat of vaporization of the cooling medium
- the temperature sensor insert into an aperture formed through the bottom portion of the processing chamber,

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- a cooling unit controller for controlling the cooling unit based on a measurement result of the temperature sensor,
- the cooling unit includes an airtight casing for accommodating the cooling medium therein, the casing has a first-end portion and a second end portion, and the first end portion is configured to be inserted into an opening formed through the bottom portion of the processing chamber, wherein the cooling unit further includes a condenser accommodating therein the second end portion to thereby liquefy, in the second end portion, the cooling medium vaporized in the first end portion (for amended claim 1).

'451 (whose field of invention is related to a vapor deposition apparatus for stabilizing and improving film quality of a thin film deposited on a substrate., Col 1 lines 5-11) teaches that the substrate is kept with the face-down orientation during film deposition to prevent dust particles from falling down on the processing surface of the substrate, thereby reducing the contamination by the dust particles of the processing surface (Col 1 lines 16-32).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have turned the orientation of the process chamber in '740 (drawing 8) by 180° so that the wafer is face-down to have reduced the contamination by the dust particles of the processing surface. Such orientation makes the sealing member 12 as existing between the bottom of the support of the mounting table (case-attaching ring 25) and a bottom portion of the processing chamber (flange 15) (see Drawing 8 of '740) (for part of the amended claim 1) and the temperature sensor insert into an aperture formed through the bottom portion of the processing chamber.

'283 (whose field of invention is cooling substrates in plasma-related semiconductor manufacturing Col 1 lines 6-9, Col 2 lines 22-26 and Col 2 lines 44-48) teaches the use of refrigeration sources outside the chamber for achieving steady-state thermal environment (Col 2 lines 4-21 and Col 6 lines 14-36).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have replaced the cooling jacket (#16) of '740 with a refrigeration source outside the chamber, in order to achieve a steady-state thermal environment (Col 2 lines 4-21 and Col 6 lines 14-36).

'145 (whose field of invention is rapid temperature response wafer chuck, title, for cooling substrates in plasma semiconductor manufacturing, abstract) teaches the use of latent heat of water to achieve rapid cooling (col. 4, lines 36-40) by taking advantage of the large latent heat of vaporization (col. 6, lines 32-33).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have sought a refrigeration unit that utilize the latent heat of vaporization to cool the wafer chuck, as taught by '145 (col. 6, lines 32-33),.

'998 (whose field of invention relates to cooling systems Col 1 lines 10-15) teaches the well-known details of refrigeration such as the cooling unit (Fig. 1) including an airtight casing (tubing from 4 through 7' through 8' to compressor 2 allows flow of refrigerant without a pressure loss, see Fig. 1 and Col line 16- Col 2 line 12) for accommodating the cooling medium (refrigerant in Col line 16- Col 2 line 12) therein, the casing has a first-end portion (evaporator 1 in Fig. 1 and Col line 16- Col 2 line 12) and a second end portion (condenser 3), wherein the cooling unit further includes a condenser (condenser 3 in Fig.1 and Col 1 lines 16-27) accommodating therein the second end portion to thereby liquefy, in the second end portion, the cooling medium vaporized in the first end portion (evaporator 1 in Fig.1 and Col 1 lines 16-27) in order to maintain optimum temperature conditions (Col 1 lines 10-15) (for amended claim 1).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have replaced the cooling jacket (#16) in the apparatus in drawing 8 of '740 with a cooling unit with the first and second end portions, and the

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condenser, as taught by '998, to have achieved steady-state thermal environment for the substrates, as taught by '283 and to have rapid cooling capability, as taught by '145.

'267 (whose field of invention relates to plasma etching apparatus in the semiconductor industry (Col 1 lines 7-13), similar to '740) teaches the use of a control system (CPU 40 in Fig.1 and Col 6 lines 29-41) that controls the temperature sensor (item 21 in Fig.1 and Col 5 lines 5-23) and the cooling unit (item 27 in Fig. 1 and Col 6 lines 29-41) for optimum usage of the refrigerant and susceptor temperature control (Col 7 lines 31-43). '267 also provides a temperature sensor (#31a, col. 6, line 32) near the sealing member (#38, col. 6, line 56).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a cooling control system as taught by '267 in the apparatus of '740 to have optimized the usage of the refrigerant and susceptor temperature control, to have the limitation "a cooling unit controller for controlling the cooling unit based on a measurement result of the temperature sensor".

'998 further teaches the limitations of:

Claim 2: the casing is depressurized (tube 4 in Fig. 1 and Col 1 lines 16-27 for maintaining optimum temperature conditions, Col 1 lines 10-15).

Claim 15: the condenser includes a vessel for accommodating therein the second end portion (see smaller structures within condenser 3 in Fig. 1).

'283 further teaches the limitation of:

Claim 12: the cooling medium is water (Col 5 lines 46-54 of '283).

For claim 20, the above combination does not explicitly teach:

The first end portion is disposed below the sealing member.

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'740 '283, '451, '998 and '267 discloses the claimed invention except for the position of the cooling unit. It would have been an obvious matter of design choice to rearrange the first end portion of the cooling unit below the processing chamber, since it has been held that rearranging parts of an invention only involves routine skill in the art. *In re* Japikse, 86 USPQ 70.

6. Claim 5 is rejected under USC 103 (a) as being unpatentable over '740, '451, '283, '145, '998 and '267, further in view of Otsuki (US 2001/0003271, hereafter '271).

The combination of '740, '451, '283, '145, '998 and '267 meets all the limitations of claim 4, as described above.

'740 teaches the presence of a CVD gas supply (item 18 in drawing 8 and [0004]), but does not specifically teach the use of a plurality of gas supplies and gas supply controllers.

'271 (whose field of invention relates to a CVD apparatus for semiconductors (Abstract and [0002]), similar to '740) teaches the use of a plurality gas supplies (items 41-45 in Fig. 1 and [0051]) and gas supply controllers (mass flow controllers, items 52 in Fig 1 and [0051]) for supplying discharge gases alternately [0049].

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have added a plurality of gas supplies and gas supply controllers in the apparatus of '740 to have had the ability of supplying discharge gases alternately.

The motivation to add a plurality of gas supplies and controller is to alternate discharge reactant gases ([0049]).

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7. Claims 16-17 are rejected under USC 103 (a) as being unpatentable over ‘740, ‘451, ‘283, ‘145, ‘998, and ‘267, further in view of Burger et al. (US 4143523, hereafter ‘523).

The combination of ‘740, ‘451, ‘283, ‘145, ‘998 and ‘267 meets all the limitations of claim 15, as described above.

The combination of ‘740, ‘451, ‘283, ‘145, ‘998 and ‘267 does not specifically teach (1) a circulation line for circulating a coolant which liquefies the vaporized cooling medium in the second end portion is connected to the vessel and a coolant supply source (for new claim 16) and (2) a pump for pumping the coolant from the coolant supply source is installed on the circulation line (for new claim 17).

‘523 (related to transfer of heat from a refrigerant, Col 1 lines 7-14) teaches (1) a circulation line (inlet line 101 in Fig. 6 and Col 8 lines 38-68) for circulating a coolant which liquefies the vaporized cooling medium in the second end portion is connected to the vessel and a coolant supply source (exchanger 98 in Fig. 6 and Col 8 lines 38-68) (for new claim 16) and (2) a pump (pump 102 in Fig. 6 and Col 8 lines 38-68) for pumping the coolant from the coolant supply source is installed on the circulation line (for new claim 17) in order to improve the thermo-dynamic effectiveness of the heat pump (Col 4 lines 27-31).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a circulation line for circulating a coolant, a coolant supply source and a pump for pumping the coolant in order to have improved the thermo-dynamic effectiveness of the heat pump (Col 4 lines 27-31).

8. Claim 13 is rejected under USC 103 (a) as being unpatentable over ‘740, ‘451, ‘283, ‘145, ‘998 and ‘267, further in view of Byrd (US 3537515, hereafter ‘515).

The combination of ‘740, ‘451, ‘283, ‘145, ‘998 and ‘267 meets all the limitations of the amended claim 1, as described above.

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The combination of '740, '451, '283, '145, '998 and '267 does not specifically teach a wick for moving the first cooling medium liquefied in the second end portion to the first end portion by a capillary force (for new claim 13).

'515 (related to a liquid coolant cooling system Col 1 lines 14-16) teaches that a wick (wick 44) enables the condensed fluid (46) to return to the vaporizer (38) by means of capillary flow through the annular wick (44) (see Fig. 2 and Col 2 lines 53-64) in order to improve the liquid cooling system (Col 1 lines 44-46).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a wick for the transfer of the coolant in order to have improved the liquid cooling system (Col 1 lines 44-46).

9. Claim 14 is rejected under USC 103 (a) as being unpatentable over '740, '451, '283, '145, '998, '267, and '515, further in view of Mundlinger et al. (US 5453641, hereafter '641).

The combination of '740, '451, '283, '145, '998, '267, and '515 meets all the limitations of the new claim 13, as described above.

The combination of '740, '451, '283, '145, '998, '216 and '515 does not specifically teach the wick is a wire net (for claim 14).

'641 (related to cooling of microelectronic devices Col 1 lines 11-14) teaches that a wick can be a porous material such as sintered metal, ceramic, screens or webbing (see Col 1 lines 55-67) in order to provide system cooling (Col 1 lines 55-67).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a screen or webbing (wire net) for a wick in order to have provided system cooling (Col 1 lines 55-67).

Response to Arguments

Applicant's arguments filed on 07/22/2008 have been fully considered but they are not found to be persuasive.

Applicants' amendment of claim 14 overcomes the previous 35 USC 112 second paragraph rejection. However, upon further consideration, a new rejection of 35 USC 112 second paragraph on claim 1 is presented above.

In regarding to 35 USC 103(a) rejection based on Ryusuke ('740), Grosshart ('283), Kobayashi ('451), Kim ('998) and Nguyen ('216), Applicants' arguments are: a) Ryusuke '740 performs a cooling operation by way of circulating a cooling medium, and not by using latent heat of vaporization, see page 9, lines 3-4, and that Grosshart '283 teaches the use of a cooling unit which performs a cooling operation by way of circulating a cooling medium, see page 9, lines 12-14; and Kim '998 does not teach or suggest using latent heat of vaporization in a plasma processing apparatus, see page 9, last two lines; b) Nguyen '216 does not teach the limitation of "temperature sensor ... near the sealing member", see the bold face sentence on page 10.

These argument are found not persuasive because:

a) In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

The examiner maintains that '283 teaches the use of refrigeration unit and '998 provides a detail implementation of refrigeration unit, as stated at the bottom of page 4 to the top of page 5 of the final office action (01/22/2008). However, to further clarify and answer Applicants' statement that neither teaches the use of latent heat of vaporization in a plasma chamber, the examiner add one more bridging reference, '145, as discussed in the rejection above.

b) Applicants' claim language "near", after further consideration, is believed to be indefinite, as discussed in 35 USC 112 second paragraph rejection above because

“near” is a relative term and does not allow a person of ordinary skill in the art to judge the metes and bound of the claim.

The examiner has left Nguyen '216 out of the current rejection. However, while all references teaches temperature sensor "near" the sealing member in the broadest reasonable interpretation, the examiner also points out that in Kazama '267, that a temperature sensor (#31a, col. 6, line 32) near the sealing member (#38, col. 6, line 56) that will fulfill Applicants' functional statement not in the claim “the temperature can be properly controlled based on the exact value” (middle of page 10 of Applicants' Argument).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Keath T. Chen whose telephone number is 571-270-1870. The examiner can normally be reached on M-F, 8:30-5:00 EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/K. T. C./
Examiner, Art Unit 1792

/Michael Cleveland/
Supervisory Patent Examiner, Art Unit 1792